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PART V

RECOMMENDATIONS

Five recommendations were made in the first edition of the *Site Compendium* (1997), and they are revisited below:

MACRO MONITORING

First, considering the entry into legal force of the 1991 Environmental Protocol to the Antarctic Treaty, it was recommended that Treaty Parties should ensure that a range of visitor sites are censused at 3-5 year intervals. The view was that, under the Protocol, environmental concerns will have to be formally assessed and evaluated in advance before any human activity — including tourism — may proceed. The Protocol's legal mandate thus forces a substantial analysis of real and potential impacts from all human activities in Antarctica, and irrespective of whether such potential impacts may be immediate or cumulative (Naveen, 1996c).

The first edition of the *Site Compendium* observed that costs of effectively monitoring all sites the Inventory has visited is staggering and that a more sensible approach is needed. The Inventory has proved to be a cost-effective means of reaching sites that are heavily visited or particularly sensitive, but still, there is no coordinated effort under Treaty auspices, to ensure that there are Peninsula-wide, Inventory-like censuses at timely intervals.

MICRO MONITORING

Another recommendation noted that some sites may require greater attention than censuses every 3-5 years. Recently published data (Naveen, et al., 2001) and further discussion in this second edition of the *Site Compendium* have identified diverse and sensitive sites that merit focused attention, particularly, those sites exhibiting high/medium species diversity or high/moderate sensitivity to potential environmental disturbance (Naveen, et al., 2001; Appendix 6).

It was further recommended in the first edition that Treaty Parties consider ensuring that biological parameters at a select number of sensitive visitor sites are assessed and monitored annually. The goal should be to provide as clear a view as possible of trends and potential causes. This effort should focus on identifying statistically significant changes in populations and parameters over time, and if possible, to distinguish if appropriate between anthropogenic change and natural fluctuations (Benninghoff & Bonner, 1985; Abbott and Benninghoff, 1990; Trivelpiece, 1991; Naveen, 1996c; Emslie, 1997). A similar suggestion has been advanced in Hofman and Jatko, 2002.

As with monitoring programs established at CCAMLR Ecosystem Monitoring Program sites, the focus should be monitoring a limited range of visitor sites, with appropriate controls (Scientific Committee for the Conservation of Antarctic Marine Living Resources, 1992; Benninghoff & Bonner, 1985; Abbott and Benninghoff, 1990). In this fashion, counts from the less frequently monitored “macro” sites then may be related to the detailed results from selected “micro” sites.

As noted in Part I, beginning in November 2003, the Antarctic Site Inventory will undertake a long-term monitoring and assessment study at Petermann Island. This effort involves a three-person team of researchers being on-site during the respective peaks of penguin egg-laying (for nest counts) and penguin chick-créching (for chick counts), and will not depend on opportunistic logistics from carefully selected expedition ships.

As a result, these long-term data sets will enable more accurate estimates of breeding population size and breeding success of Adélie penguin (*Pygoscelis adeliae*), gentoo penguin (*Pygoscelis papua*), and blue-eyed shag (*Phalacrocorax atriceps*), and allow direct and cumulative impacts at these sites to be detected precisely.

Further, such data, will ensure that the best scientific data and descriptive information are available should Antarctic Treaty Parties determine that site management is necessary and appropriate in the future and contribute to a better understanding of biological processes in the entire Antarctic Peninsula region,

CORRELATION STUDIES

In terms of long-term effort to detect changes and distinguish between natural variability and changes potentially induced by human visitors, the critical data collected by the Inventory will be those related to variable, biological parameters. These must be assessed rigorously from visit-to-visit and season-to-season. Moreover, there will need to be long-term studies that compare ecosystem variability at sites being visited by tourist with ecosystem variability at control sites where tourists are excluded (Trivelpiece, 1991).

To this end, the Inventory has sought to define census colonies at each site and to establish some of these as prospective *control colonies*.

Therefore, it is critical that the biological data are sufficiently rigorous to enable key biological parameters (e.g. productivity and recruitment rates) to be analyzed and compared in future environmental assessment and monitoring programs. In the CCAMLR Standard Methods, productivity refers to the number of chicks per active nest, which requires nests to be counted at the peak of egg-laying and chicks to be counted at the peak of chick-crèching (Scientific Committee for the Conservation of Antarctic Marine Living Resources, 1992). The long-term monitoring study that will commence at Petermann Island is intended to ensure that such rigorous data are collected.

NONSPECIFIC SITE VISIT REPORTING

Site visit reporting continues to be plagued by inexactitude, lost data, and confusion.

In filtering the NSF/OPP visitation compilations to examine zodiac landings, it becomes immediately apparent that many nonspecifically described sites are recorded; for example, “Deception Island,” “Paradise Bay,” “Elephant Island,” “Laurie Island,” “small peak, Errera Channel,” and the “Argentine Islands.” Precise landing sites exist in each of these general vicinities, but which ones, indeed, were visited is unclear.

Also, there are duplicate listings in the NSF/OPP compilations for many sites; for example, Jougla Point and Port Lockroy (but not the newly restored hut and visitor site at nearby Goudier Island), and “Rongé Island” and “Georges Point, Rongé Island.” For purposes of the *Site Compendium*, many of these duplicate listings are combined.

Recently, Inventory researchers participated in initial visits to four “new” sites — Camp Hill, False Island Point, Jade Point, and Point Obelisk, which, inexplicably, did not appear in the NSF/OPP compilations, though, to the best of our knowledge, these visits were accurately reported. Perhaps the Point Obelisk visit was recorded, imprecisely, for James Ross Island, and the False Island Point visit, imprecisely, for Vega Island. Nonetheless, all four sites are included in the *Site Compendium*.¹

The first edition recommended that NSF/OPP and the International Association of Antarctic Tour Operators (IAATO) take steps to remedy this imprecision, but, clearly, this difficulty continues. At present, at least thirty nonspecific sites are listed in the data compilations.

A companion recommendation noted that a goal of projects like the Antarctic Site Inventory is generating accurate breeding chronologies of penguin and flying bird species nesting at various sites. Ultimately, analyses of the potential environmental effects of passenger-visits will need to consider breeding chronologies vis-à-vis the timing and frequency of visits to particular sites.

At present, summary NSF/OPP-compiled data suggest a statistical interval between visits (given in days), though in all likelihood, certain sites are actually visited more than once per day. It is still recommended that future compilations of seasonal visitor statistics set forth, in greater detail, the exact timing of all visits and, concomitantly, the precise intervals between all visits.

¹ As noted in Part I, Inventory researchers have visited sites that are not regular tourism venues (e.g. Eden Rocks, Jonassen Island), and these have been routinely included in the *Site Compendium*.

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